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This report details the results of Analytics' Phase II efforts under contract F33615-83-C-5098. The main findings of the report are: (1) The system set up to handle Government Industry Data Exchange Program (GIDEP) ALERTs within the Air Force is not followed in a consistent fashion. (2) All participants in the GIDEP program are required to report the total yearly savings as part of "GIDEP ANNUAL PROGRESS REPORT." The majority (approximately 90%) of cost avoidance are not being reported due to lack of data, lack of personnel or lack of a method to accurately determine savings. (3) The GIDEP participants are relatively slow to issue ALERTs. (4) There is no formally documented system for determining that the Air Force's warranty rights are being enforced on items reported under the GIDEP ALERT system. (5) Contractor participation in the GIDEP program is basically voluntary. When accepted by contractors, the Air Force imposes DI-R-3548 to make issuance of and response to ALERTs a contractual requirement.

As a result of analysis of the GIDEP ALERT system, the following changes to ALERT

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processing procedures were recommended: The MM_R (the Engineering and Reliability branch of material management) function at each organization impacted by the ALERT should identify the Part Family Code and complete a "Cost Avoidance Estimating Sheet" in accordance with the instructions provided in Appendix A. DPCCP managers at both AFSC and AFLC should summarize all "Cost Avoidance Estimating Sheets" to develop a data base and provide summary cost avoidance statistics by part family to HQ AFLC. The contracting function of the agency receiving the ALERT should follow the procedure recommended in Chapter 6 of this report for evaluating and documenting warranty rights and actions required.

In addition to these proposed changes to the GIDEP procedures, a method for computing the cost avoidance due to an ALERT was developed. The research team demonstrated the applicability of the proposed method by applying it to all ALERTS received by the Air Force from January 1982 through June 1982.

ADA 145470
BRMC-83-5098

BENEFIT VALUE TO THE AIR FORCE OF THE GIDEP ALERT

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15 June 1984

Final Report for Period Covering 30 September 1983 - 15 June 1984
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Prepared for
AIR FORCE BUSINESS RESEARCH MANAGEMENT CENTER
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The views expressed herein are solely those of the researcher(s)
and do not represent those of the United States Air Force.

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1. INTRODUCTION

This report documents the results of Analytics' Phase II efforts under contract F33615-C-5098 for the Air Force Business Research Management Center. It covers the period 30 September 1983 through 6 April 1984 and conforms to the research approach described in Analytics' Proposal No. 83-40112 and Technical Report 1913-TR-01 dated 27 October 1983, Benefit Value to the Air Force of GIDEP ALERT.

The GIDEP system provides a means of technical data interchange among DoD agencies, NASA, and industry. The data exchanged includes defective parts, test reports, manufacturing processes, non-standard specifications, electronic equipment characteristics, metrology and calibration procedures, industrial equipment processes, techniques, methods, and related materials.

The particular element of the GIDEP system evaluated under this effort is the ALERT system. An ALERT is intended to disseminate potential problem area date to the GIDEP participants in an effort to avoid and minimize occurrences of part and material quality problems at their facilities.

This research was initiated by the need to improve the ability of the Air Force to estimate the potential cost avoidance value of actions taken to correct deficiencies announced through Government-Industry Exchange Program (GIDEP) ALERT. The contract required:

1. Review existing Air Force GIDEP ALERT procedures.
2. Develop and document a method that accurately estimates the potential cost avoidance value to the Air Force of action taken to correct the deficiency identified by a GIDEP ALERT.
3. Demonstrate that the method fits 95% of the ALERTs received by Air Logistics Centers during a 6-month period.

4. Evaluate the actions taken by the Air Force to ensure the Government's contract warranty rights, with respect to defective parts, are enforced.

AFLC/AFSCR 800-20, Defective Parts and Components Control Program (DPCCP), defines the responsibilities of organizations within the AFLC & AFSC in regards to the GIDEP ALERT SYSTEM. Once an ALERT is prepared either internally or externally (other government agencies, contractors, etc.), this regulation defines the distribution of GIDEP ALERTs by each command and organization.

All participants in the GIDEP program are required to report their total annual savings as part of their "GIDEP ANNUAL PROGRESS REPORT." This report is required per the GIDEP POLICIES PROCEDURES MANUAL. The Air Force requires a semi-annual "Benefit & Utilization Report" (Per ALFC/AFSCR 800-20) on defective parts and component control program. This report is required from each division of the Air Force, portions of the information is redundant to the "GIDEP Annual Progress Report" required by the GIDEP Operation Center. In both these reports, the majority (approximately 90%) of the cost avoidance is not being reported at the present time due to lack of data, manpower, or a method for accurately determining savings.

It is important that these cost avoidances and benefits are accurately estimated and reported. The reported estimates will in turn provide a basis for determining cost effectiveness of the GIDEP ALERT system.

1.1 STUDY PLAN

The study plan proposed within the Analytics Technical Report 1913-TR-01 (Phase I) on 27 October 1983, was accomplished with minor changes based on results of information gathered and knowledge obtained during the study process.

A three day visit to ESD was cancelled and replaced by a five day visit to Space Division, Ballistic Missiles Office, The GIDEP Operation Center, Rockwell North American, TRW, Northrup, and Hughes Aircraft. The change in visit was made to provide a more detailed evaluation than was originally proposed.

The implemented study plan is summarized below:

1. REVIEW EXISTING AIR FORCE GIDEP ALERT PROCEDURES (SOW 4.3.1)

In accomplishing this task, Analytics conducted an in-depth review of the policy and procedures for the Air Force DPCCP as specified in AFR 80-10, 800-20, and AFLC/AFSC Regulation 800-20. These procedures apply to those AFLC and AFSC activities that support the DPCCP and use the Government/Industry Data Exchange Program (GIDEP). Analytics paid special attention to the implementation of policy, procedures, and development of usage and cost avoidance data in order to determine whether the data was based upon actual costs or the rules of thumb contained in AFLC/AFSC Regulation 800-20.

2. Develop and Document a Method which Accurately Estimates the Potential Cost Avoidance Value to the Air Force of Action Taken to Correct a Deficiency Announced Through a GIDEP ALERT (SOW 4.3.2)

A GIDEP ALERT defines the actual occurrence of a failure or a potential source of a problem, including such issues as:

- Faulty design or changes in the design of fabrication which may cause nonconformance to procurement specifications.
- Faulty production or processing technology.
- Unusual failures and potential failures under normal operating or storage conditions.
- Failures of the same part and material which are indicative of failure trends.

Detection of a problem or potential problem leading to the issuance of a GIDEP ALERT and resolution of the problem may have a profound cost-avoidance effect on supply, storage, maintenance, calibration, safety, and the engineering standardization programs. Analytics integrated the cost elememts contained in AFLC/AFSC Regulation 800-20, cost elements reported to AFLC and AFSC through the established usage and reporting system, and other identifiable relevant cost elements to develop and document a method that accurately estimates the potential cost-avoidance value to the Air Force of action taken to correct a deficiency announced through a GIDEP ALERT. Where actual data is non-existent, data sources and methods of data collection have been suggested.

3. <u>Demonstrate this Method Fits 95% of the ALERTs Received by Air Logistics Centers Pertaining to Air Force Used Hardware Over a Six-Month Period of Time (The ALERTs Will be Provided by Headquarters AFLC/MMEA (SOW 4.3.3)</u>

During the accomplishment of subtasks 1 and 2 indicated above, Analytics confirmed that the GIDEP ALERT policy and procedures are being implemented, and identified areas of weaknesses in their implementation. By collecting a 100% sample of GIDEP ALERTS (1975 thru 1983) from Headquarters AFLC/MMEA, along with the reported cost data elements, we integrated these elements into our cost model to insure that our method fits at least 95% of the ALERTs received by the ALCs over a six-month period. The demonstration of methodology has been described in Section 5 of this report.

4. <u>Evaluated the Actions Taken by the Air Force to Ensure the Government's Contract Warranty Rights With Respect to Defective Parts are Enforced. Review and Document the Chain of Events for a Typical Item and Illustrate How the Problem is Traced to the Original Contract. Document and Recommend the Improvements in the Review Procedures Used (SOW 4.3.4)</u>

During the execution of this task, Analytics examined relevant regulations, policies and procedures with respect to warranties, and evaluated whether the Air Force is enforcing its rights. Specific recommendations for improvements in the review procedures have been made in Section 6 of this report.

The interim review and discussions were held with Mr. Robert Lough and Maj. J. Weber, and any changes to the original study plan were coordianted with the contracting officer prior to implementation.

2. SYSTEM REVIEW

The system review consisted of a review of the available literature and interviews with the personnel responsible for the GIDEP ALERT system in various organizations. The interviews were conducted either by personal visits or by phone calls. Following is a list of all the organizations interviewed and Section 2.3 provides the specifics of the actual personnel and the organizations visited.

- Air Force Systems Command (AFSC)
- Aeronautical Systems Division (ASD)
- Armament Division (AD)
- Electronic Systems Division (ESD)
- Headquarters Air Force Logistics Command (AFLC)
- Warner Robins, San Antonio & Ogden ALC's
- Space Division (SD)
- Ballistic Missiles Office (BMO)
- GIDEP Operations Center
- North American Rockwell
- Hughes
- Northrup
- T.R.W.

2.1 LITERATURE REVIEW

During Phase I a wide range of literature related to the GIDEP ALERT program was reviewed. This literature consisted of Air Force/AFSC/AFLC, regulations, military standards, reports, and military and commercial presentations. A preliminary review of ALERTs from 1975 through 1983 was conducted to identify the data available on types of items alerted, analysis performed, system application, savings documented, and to identify other variables to be evaluated during the detailed review of ALERTs for a six-month period. The period of January 1982 through June 1982 was selected for detailed reveiw of ALERTs and for application of research results. Appendix D provides a list of literature reviewed. "Alert Processing Procedures" (Sec. 2.2) was developed based on this review.

2.2 ALERT PROCESSING PROCEDURE

Analytics has developed a flow chart that depicts the GIDEP ALERT distribution as specified in AFSC/AFLCR 800-20 (Appendix A, Figure 3A: ALERT Flow Chart, MM-R Initiated, Figure 3B: Contractor Initiated). An ALERT can be initiated by any individual or organization participating in the GIDEP program. As noted in the chart these activities are primarily associated with the development, production, maintenance, supply, engineering, and quality assurance of military systems, equipment, and associated material. ALERTs can be initiated directly against parts and components or they can be initiated based on investigation of Material Deficiency Reports (MDRs), Material Improvement Programs (MIPs), Quality Deficiency Reports (QDRs), and Teardown Deficiency Reports (TDRs). All ALERTs, once initiated, are sent to the product manufacturer for coordination. The product manufacturer must respond within 14 days and then the ALERT is released to the Operation Center for general release. Safety ALERTs can be released immediately without manufacturer coordination. Upon the release of an ALERT by AFLC, it is distributed to DPCCP Managers within AFLC and ALC. Simultaneously the ALERT is processed through the GIDEP Operation Center and distributed to all participants in the GIDEP system. Action to correct deficiencies identified by each ALERT is the responsibility of each receiving organization. A number of actions can be taken as follows:

1. Ignore the ALERT
2. Attrite the item
3. Scrap the part
4. Rework the part
5. Request design change
6. Inspect parts thoroughly
7. Revise performance limits
8. Require 100% testing of the part
9. Direct supply service not to issue the part
10. Drop the supplier from the Qualified Products List (Q.P.L.)

The ALCs follow the procedure identified in AFSC/AFLC 800-20. Inconsistencies between the ALCs are due to management support of the program, the amount of effort and willingness of the DPCCP manager to back the program, and the number of personnel assigned to implement the program.

The GIDEP ALERT system results in following benefits:

* Improved selection of parts/vendors
* Immediate corrective action on problem areas
* Identification and elimination of unreliable parts and materials in new systems.
* Improved availability and reliability of current and new systems and equipment
* Reduced maintenance costs
* Improved visibility of potential problem areas for program managers.

2.3 INTERVIEWS

Visits were made to ten organizations (listed in Figure 1) and meetings were held with the personnel responsible for the GIDEP ALERT system. These interviews established the following for each organization:

* ALERT processing procedure in terms of:
  * Issuing an ALERT
  * Receiving an ALERT
* Cost avoidance estimating procedure
* Unique requirements
  * AFLC & ALC's
  * AFSC
  * AFPRO's
  * Contractor's

The general ALERT procedure is detailed in Section 2.2 "ALERT PROCESSING PROCEDURE." The unique aspects of the operational differences by organization type are listed below.

Figure 1.

ORGANIZATIONS AND DATES OF VISIT		
Date	**Location**	**Personnel Visited**
30 Nov - 1 Dec 1983	Warner Robins ALC	Mr. B. Bell Mr. R. Bennett Mr. B. Kitchings
4 Jan 1984	2750 ABW/ES	Mr. H.W. Arant Mr. F. Thirtyacre Mr. D. Hopper
10 - 11 Jan 1984	Ogden ALC	Mr. D. Flackman Mr. B. Murphy
2 Apr 1984	Rockwell North American	Mr. R. Mioli (AFPRO) Mr. D. Dinwiddle (Rockwell)
3 Apr 1984	Hughes	Ms. M. Echenrod (AFPRO) Mr. B. Quinn (Hughes) Mrs. M. Napial " Mr. W. Miles "
3 Apr 1984	SPACE DIVISION	Mr. J.M. Teresi (Aerospace) Maj. R. Dodge (SD/ALT) Mr. A. Murakami (SD/ALT) Mr. R.D. Ebert (SD/ALT) Mr. B. Theall (SD/ALT)
4 Apr 1984	Ballistic Missles Office	Maj. G. Devinger Maj. Jungwirth
4 Apr 1984	GIDEP Operation Center	Mr. B. Arnitz Mr. G.A. Carver
5 Apr 1984	Northrup	Maj. E. Reeves (AFPRO) Mr. B. Mueller (AFPRO)
5 Apr 1984	TRW	Mr. B. McIver (AFPRO) Lt. Col. Wernle (AFPRO)

1. <u>AFLC & ALC</u>:

AFLC and the different Air Logistics Centers generally follow the procedure specified in AFSL/AFLCR 800-20 with the following differences:

- There is no consistent method for estimating cost avoidance and the majority of the savings are not reported.
- Due to personnel limitations, primary consideration is given to reviewing Material Deficiency Reports (MDRs) and initiating Material Improvement Projects (MIPs). This results in generating only a few ALERTs and the majority of the problems being resolved through other means. These actions resolve the problem locally but do not accomplish the basic purpose of the ALERT, i.e., communication of the problem to all other organizations.
- The Headquarters AFLC/DPCCP Manager issues a semi-annual "Benefit and Utilization Report" based on inputs received from individual ALC's. This is the only summary report of this kind being issued by any participant in GIDEP. This report summarizes all GIDEP related activities in AFLC.

2. <u>AFSC</u>

AFSC's are not directly involved in the GIDEP ALERT system and basically monitor the contractor's performance. The following are the main activities performed by AFSC's as related to GIDEP ALERT system:

- The local DPCCP manager receives an ALERT from the GIDEP Operations Center. These ALERTs are kept on file and copies are made available to program offices in order to assess the impact on their programs.
- The ALERT is received by the contractor at the same time it is received by the AFSC's DPCCP manager. In most cases, the contractor notifies the program office of the expected impact. The program office then organizes a follow up based on this information.
- All contracts call for compliance with DI-R-3548, thus making the issuance and the response to ALERTs a contractual requirement. Program offices monitor the compliance to this requirement.
- Program offices occasionally direct a termination of all shipments from the contractor until the ALERTED problem is resolved. The possible termination of shipments is a condition of the severity of the problem.
- ALERTs are generally not issued by AFSC (Program Office). The contractor is notified of the need to issue an ALERT and if the contractor refuses to do so, only then is the ALERT issued by AFSC. An analysis of the data from 1975 to 1983 did not indicate any ALERTs generated by AFSC.
- There is no "Benefit or Utilization Report" issued by AFSC.

- Ballistic Missiles Office has subcontracted all GIDEP ALERT related efforts to TRW. All distribution and reporting within BMO is handled by TRW. Space Division has similarly contracted GIDEP related efforts to Aerospace, Inc.

3. AFPRO

Similar to AFSC, AFPRO's are not directly involved in the GIDEP ALERT system. As the Air Force plant representatives, the DPCCP managers assure compliance to the requirements imposed by the AFSC program office. The following illustrates the AFPRO's involvement in the GIDEP ALERT system:

- The AFPRO DPCCP manager receives ALERT from CMD (Contracts Management Division).
- The ALERTs at the AFPRO are maintained for information only. Any actions to be taken are directed by CMD.
- The AFPRO's periodically review the open ALERTs and follow up on actions being taken.
- There is no "Benefit or Utilization Report" issued by the AFPRO's.
- All information exchange with the GIDEP Operations Center is maintained at the CMD Headquarter level. The individaul AFPRO's do not get involved with this activity.

4. CONTRACTORS

Each contractor has its own system of handling GIDEP ALERTs, however common basic system characteristics exited between contractors. The following depicts some of those common basic system characteristics:

- Each of the contractors interviewed had a fairly good system of responding to the ALERTs received. The basic differences were in the level of the automation of the reports.
- None of the contractors interviewed reported any cost avoidances. The savings reported were generally related to the cost of implementing an ALERT, rather than the cost avoided as a result of an ALERT.
- The level of activity at the contractors seemed to vary, based on whether the ALERT system effort was directly charged to the contract or not.
- All the contractors have internal failure data reporting systems. The purpose of these reporting systems is to expedite a response to the identified failures and problems, because the GIDEP ALERT system is considered relatively slow.
- Contractors generally do not like to issue GIDEP ALERTs because of legal ramifacations.

2.4 SHORTCOMINGS OF THE CURRENT SYSTEM

The following shortcomings were identified as a result of interviews and an analysis of the system as it presently functions

1. Lack of high level management support.

2. Failure of the organizations reviewing MDRs, MIPs, TDRs, and QDRs to generate ALERTs when required. This failure is basically due to:

   - Lack of manpower.

   - Contractors generally avoid writing ALERTs because of the possible legal ramifications.

   - Maintenance, quality and supply organizations that handle MDRs, MIPs, TDRs, and QDRs are mainly interested in resolution of problems and not in issuing ALERTs for general distribution.

3. AFSC/AFLC 800-20 does not specify a review of warranty requirements.

4. DO 49 (Component Item Review by Stock No.) is not always up to date and does not provide current information to personnel who are preparing cost savings reports.

5. The lack of personnel has a major impact on the determination and reporting of cost savings. Ogden savings doubled with the addition of one person. AFALD reports near zero savings because of the lack of personnel needed to process the ALERTs. SAALC savings dropped from the highest of all ALCs to nearly the lowest, with the retirement of one individual.

6. Cost savings account for dollar savings but do not truly quantify the impact of keeping the Air Force flying.

7. Lack of action on certain ALERTs. Some ALERTs had been in the system 7 to 8 months without resolution. A perfect example is the ALERT on tie down fittings. The fittings are prohibited from being used in an aircraft, but no replacements have been procured.

8. Difficulty experienced by maintenance organizations to identify items by the manufacturer, lot number, and date of manufacture, etc. (cost to maintain these types of controls could be prohibitive).

9. Difficulty in the management of older aircraft/missile systems: (a) lack of a prime contractor, (b) inadequate specifications and drawings, and (c) vendors are either out of business or are no longer manufacturing the equipment.

10. Internal problems created by the issuance of an ALERT when the problems were created due to the mishandling by service/technical personnel.

11. ALERTs are not issued against throwaway items.

12. GSA does not participate directly in the ALERT system (GSA issues problem information sheet).

13. The ALERTs are not traceable to a specific system or subsystem. (Traceable only when end item is a single usage item. This is deliberate because of security reasons).

14. An excessive amount of time is required to research the multiplicity of documents that identify costs essential to accurately determining cost savings.

15. An excessive time lag between the identification of an ALERT, its final issuance and its distribution. This delay results in a number of participants running an internal ALERT-type system within their own organizations.

16. Participation in the GIDEP ALERT system is voluntary on certain programs, while a contractual requirement on others. This causes a variation in interest and effort expended by the different programs and contractors.

3. METHODOLOGY FOR ESTIMATING COST AVOIDANCE

This section provides a guideline for estimating the cost avoidance resulting from issuance of an ALERT. The objective of this section is to provide uniform methodology and cost elements for estimating cost avoidance due to an ALERT. The methodology is general and may not be applicable to all situations. It may be necessary to adjust the format and algorithms provided.

3.1 TERMS AND ABBREVIATIONS EXPLANATION

a. Cost Avoidance - This is an estimate of costs that would have been incurred in the absence of an ALERT. This does not cover any costs associated with issuing, handling, and/or processing an ALERT. There are two types of

   1) Maintenance Cost Avoidance -- when an ALERT results in avoidance of a future maintenance action, all the estimated costs of the maintenance are considered as cost avoidance as a result of the ALERT. This includes the unplanned maintenance actions on the part on ALERT.

   2) Failure Cost Avoidance -- all costs associated with a failure that would have been incurred if the ALERT was not issued, are considered in this category. It must be noted that a failure cost avoidance occurs only on parts that have been installed in the field and would have resulted in a failure if not replaced as a result of the ALERT. Avoidance of maintenance costs resulting from failure of the part on Alert are considered as failure cost avoidance. The cost avoidance due to an ALERT is estimated for organizations other than the initiating organization. The organization issuing the ALERT was already aware of the problem and any cost avoidance within that organization is not the result of the ALERT system.

b) Designed Life - This is the expected life of the item as specified by design.

c) Actual Life - This is the estimated life based on experience or the engineer's judgment, given the existence of the problem specified in the ALERT.

3.2 SYSTEM OVERVIEW

It must be recognized that simply issuing an ALERT does not result in cost savings. In order to generate cost savings a recipient of the ALERT must take action to correct the deficiency identified in the ALERT. The following is a list of actions to take when an ALERT is received in an organization:

- Identify the systems that use the part on the ALERT. Provide a copy of the ALERT to the program managers to review, when it impacts their programs.
- Decide on the action to be taken (Available decisions listed in Section 3.2.1).

3.2.1 Decision Processes

The following is a list of possible actions resulting from an ALERT:

1. Ignore the ALERT
2. Attrite the item -- use until exhausted
3. Scrap the part
4. Rework the part
5. Request an ECP to modify the design
6. Inspect the in-house stock thoroughly, as well as require a thorough inspection of the future acquisitions of the same part
7. Revise the performance limits
8. Require 100% testing of the part
9. Direct the supplying service not to issue the part
10. Drop the supplier from the Q.P.L.

The cost impact of each of these actions or decisions is described below:

1. Ignore the ALERT -- no cost avoidance.
2. Attrite the item -- may result in cost avoidance of unplanned maintenance in cases where the ALERT disposition results in a replacement part that will provide reduced maintenance in the future.

3. Scrap the part -- results in a failure cost avoidance.

4. Rework the part -- results in a failure cost avoidance. This assumes that had the part not been reworked or scrapped, it would have resulted in a premature failure.

5. Request a design change -- results in a failure cost avoidance.

6. Inspect the parts thoroughly -- results in a failure cost avoidance because without thorough inspection, some of the unacceptable parts could have been used in the system and could have resulted in a premature failure.

7. Revise the performance limits -- could result in a maintenance cost avoidance. The reduction in expected life will require unplanned maintenance actions.

8. 100% testing of the part -- results in a failure cost avoidance.

9. Direct supply service not to issue the part -- no cost avoidance is expected with this action alone, because this has to be used along with one of the other actions and the cost avoidance can be estimated under that action.

10. Drop supplier from the Q.P.L. -- no cost avoidance can be estimated with a reasonable degree of accuracy except where a replacement part, with improved performance, is procured.

3.2.2 Algorithms

The method of the computing cost savings described below was selected over other possible methods because of its simplicity. The data necessary to estimate the savings is readily available, and the mathematical equations can be easily developed and computed.

The cost avoidance resulting from an ALERT is computed through the use of the "Cost Avoidance Estimating Sheet," (Appendix A, Figure 1). Appendix A details the instructions for completion of the cost avoidance estimating sheet. The following algorithms are used in computation of cost avoidance as a result an ALERTs.

Expected failure cost avoidance = $C_1 \times (1-A/D) \times N_1$, where,

A = Actual life, given the problem identified in the ALERT

D = Designed life

N_1 = Total number of parts impacted by the ALERT

C_1 = Estimated cost of each failure

Expected maintenance cost avoidance = $C_2 \times (1-M_1/M_2) \times N_1$, where,

M_1 = MTBF of part on ALERT

M_2 = Expected MTBF of replacement part

C_2 = Estimated maintenance cost occurrence

The estimated cost of a failure or maintenance per occurrence can be estimated by the MM-R (Engineering and Reliability Branch) responsible for taking the action on an ALERT. Listed below are examples of the types of items to be considered in estimating the failure or maintenance costs:

- Cost of the weapon system
- Cost of operation of the weapon system per hour
- Cost of a military or civilian employee
- Labor cost per hour
- Number of different parts included in the equipment type which is covered by the ALERT
- Number of different equipments which use the subject part
- Redundancy, resulting in the reduction of the impact due to a failure
- Increased failure rates
- Increased trouble shooting - intermittent failures
- Cost of a mission failure
- Cost to diagnose the failure on a part

Appendix A, Figure 4 details a number of sources of the cost data available to assist in developing the cost estimates. In the cases where data is not available to make a detailed cost estimate, Appendix A, Figure 5 provides some quick estimates based on historical averages.

4. METHOD OF REPORTING

The failure experience data bank and the available ALERT information does not identify the data required to estimate a cost avoidance. The following recommended additions to the ALERT processing procedure will result in the creation of a historical data base to be used for estimation of a cost avoidance:

1. Group Technology Code -- classify the parts in specific part families.
2. Cost Avoidance Estimating Sheet.
3. Data base of cost avoidance history by part family (Group Technology Code).

4.1 GROUP TECHNOLOGY CODE

It is recommended that each part be identified to a specific part family based on the part characteristics. The recommended Group Technology Code consists of two segments, i.e., Item Category (one character) and WBS (up to three characters).

X X

Item Category	WBS (Application) Ref MIL-STD-881A
E - Electrical	A - Aircraft system B - Electronic system
M - Mechanical	C - Missile system D - Ordnance system
C - Chemical	E - Ship system F - Space system G - Surface vehicle system H - Miscellaneous

The utilization of the WBS as a part of the group technology code provides flexibility to identify the part family in any detail desired by going further down into the WBS levels. MIL-STD-881A identifies a major system at Level 1 (i.e.,aircraft system, electronic system, etc.). Level 2 defines the major segment within a system (i.e., training, support equipment, system test and evaluation, industrial facility, etc.). Level 3 and below further defines detail within a segment of a system.

For the purposes of this report, the parts are identified by item category and Level 1 of WBS only to provide an example of the group technology coding.

4.2 COST AVOIDANCE ESTIMATING SHEET

The engineer assigned to make the decision on the ALERT at each ALC will use the cost avoidance estimating sheet, as detailed in Section 3, to estimate the cost avoidance. Appendix A, Figure 2 provides detailed instructions for completing the cost avoidance estimating sheet.

4.3 DATA BASE FOR COST AVOIDANCE HISTORY

It is recommended that Headquarters AFLC create a computer data base to trace the cost avoidance reported against each ALERT. As a minimum, the system should track the average cost avoidance per occurrence by the group technology codes.

The group technology code should be assigned by the DPCCP manager of the ALC or the contractor issuing the ALERT. The ALERT issued to the GIDEP Operation Center will have a group technology code assigned to it prior to its general release. The existing procedure (detailed in Section 3) will be followed through the action on the ALERT by the Engineering and Reliability Branch (MM-R) at each ALC. The MM-R will fill out the cost avoidance sheet after making the decision on the actions to be taken as a result of the ALERT. The DPCCP manager at each facility will accumulate all individual cost avoidances and submit it along with the quarterly report to Headquarters AFLC. Then AFLC will create and maintain the cost avoidance data base organized by the group technology code.

5. DEMONSTRATION OF METHODOLOGY

ALERTs received during January 1982 through June 1982 were used to demonstrate the applicability of the proposed methodology to estimate a cost avoidance. Appendix B provides the summary of data on the ALERTs received during the period specified above. The following data is summarized for each ALERT:

1. ALERT number
2. Date of ALERT
3. Item description
4. Category -- source for ALERT
   a. issued by the Air Force
   b. issued by other DOD
   c. issued by NASA
   d. issued by the contractor
5. Problem description
6. Cause of the problem as identified on the ALERT and/or support documentation
7. Contractor response
8. Action taken -- based on decisions indicated in Section 2
9. Systems impacted by the ALERT, if available
10. Failure rate, if possible

During the collection of the above data, detailed information concerning items 5 through 10 was not available in the failure data banks. Therefore, in a number of instances, assumptions were made as to the system impacted, number of units, and the failure rate.

For each of the ALERTs received during the demonstration period, a group technology code was assigned and a cost avoidance was estimated based on the methodology detailed in Section 3. In the cases where data was not available, an attempt was made to contact the person who initiated the ALERT in order to secure the data on the number of parts and the failure rate, etc. Assumptions were made to complete the cost estimating sheet. The overall cost avoidance for each ALERT, along with assumptions used, is summarized in Appendix C. No cost avoidance estimate was made in cases where the action taken was either "Direct supply service not to issue the part" or "Drop supplier," without indication of an alternate action.

Based on the data in Appendix C, it is evident that the methodology was applicable to all ALERTs received during the demonstration period. Although assumptions had to be made for demonstration, the actual data should be available to the MM-R, thus providing accurate cost avoidance estimates. Appendix C demonstrates that this methodology was applicable to all ALERTs received during the six-month period (January 1982 to June 1982) and this exceeds the 95% applicability requirements of the contract.

6. ASSURANCE OF WARRANTY RIGHTS

The available data as well as AFLCR/AFSCR 800-20 does not document how the government's warranty rights are ensured. Review of GIDEP ALERT system indicates that in practice the government's warranty rights are being ensured as described below.

At each ALC a copy of the ALERT is forwarded to the procurement authority who provides comments on applicable warranty rights to the DPCCP manager. Although not supported by documentation, this procedure assures that government's warranty rights are protected. In approximately 85% of the cases, contractors either replace, rework or provide rework cost to the Air Force on parts requiring such actions. In a number of cases replacement is provided voluntarily by contractors because the ALERT system can result in negative publicity.

In order to ensure compliance with warranty requirements and provide documentation of such actions, the following changes are recommended for ALERT processing procedures:

1. Update AFLCR/AFSCR 800-20 to specify the requirement to forward a copy of the ALERT to the contracting management of the procurement organization for review of applicable warranty clause and provide warranty status to DPCCP manager.

2. Update the ALERT form to provide information on the warranty status at each location on parts impacted by the ALERT.

The above items are being followed in a loose and undocumented manner in the current system. Implementation of the procedure recommended above will ensure that the system is being followed consistently by each location. The following information documents the chain of events for a typical item from issuance of an ALERT to the tracing of problems to the original contract.

Upon receipt of an ALERT, the DPCCP manager first reviews the ALERT and the contractor's reply. The DPCCP manager distributes then the ALERT. A copy of each ALERT is forwarded to the Contracting and Manufacturing (PM) function. The ALERTs are reviewed and a copy, with any comments made by PM, is entered into the Contractor Responsibility Review Program (CRRP) file. Depending on previous entries and/or comments, it is the responsibility of the PM review activity to alert DPCCP manager of any previous unsatisfactory reviews. In coordination with the MM-R, DPCCP, and Supply initiate action against the contractor to enforce the government's rights under the warranty clause of the contract. It is at this decision point that the supplier can be dropped from the Qualified Products List (QPL) or action can be initiated to prohibit future procurements of the deficient item.

7. RECOMMENDATION FOR FUTURE RESEARCH

This research effort has established a methodology for estimating the potential cost avoidance value for each GIDEP ALERT. This method will require the following additional effort on the part of all GIDEP participants.

- Assign a Group Technology Code by part family.
- Identify the action to be taken.
- Complete the Cost Avoidance Estimating Sheet.
- Create a historical data base on cost avoidance, per part by part family.
- Utilize the data base created by the part family to create an estimating matrix for estimating the cost avoidance by part.

The procedure indicated above will require extended time (i.e., two or three years) to build sufficient data in the data bank needed to estimate cost avoidance by part family.

This generation of the data base mentioned above can be expedited by developing data on cost avoidance from past ALERTs. As the data required is not currently documented, the following additional efforts would be required:

- Identify all organizations that took action because of an ALERT. GIDEP annual progress reports and DPCCP managers of various organizations will be required to help in this task.
- Work with the organizations identified above to gather data required for completing "Cost Avoidance Estimating Sheets."

As a follow-on research it is recommended that the Air Force should attempt to create a data base on the historical data as mentioned above. This will provide a simpler method for estimating cost avoidances expeditiously, thus making the GIDEP participants more receptive to the proposed methodology.

SELECTED BIBLIOGRAPHY

AFR 800-20	Defective Parts and Component Control Program (DPCC) Benefit and Utilization Report
AFLC/AFSCR 800-20	Defective Parts and Components Control Program
AFR 400-31	Vol II, Visibility and Management of Operating and Support Program Weapons Support Costs, WSSC
AFR 400-31	Vol IV, Visibility and Management of Operating and Support Cost
AFLCR 400-49	Weapon System Effectiveness Program (VAMOSC) Component Support Cost System (CSCS)
TO 1F-15A-06	Work Unit Code Manual
SNUD (D071)	Stock Number User Directory
MRD	Master Requirements Directory
D008A	Twelve-Month Trans History
VAMOSC	Air Force Operating and Support Costs
	Technology Transfer Through GIDEP (Presentation Paper)
	Quality Assurance Program Study (NSIA), 1969
AFLC Pamphlet 173-10	AFLC Cost Planning Factors
AFLC Pamphlet 173-10	A Guide for Estimating Aircraft Logisitics Support Costs
	Product Performance System
AFR 173-13	USAF Cost and Planning Factors
AFLCLR 67-8	Supply Support Request (D169 Report)
AFLC 173-264	Weapon System Retrieval System (WSCRS)(H036C)

AFLCM-65-1	Master Material Support Record (D049)
AFALDP 800-4	Aircraft Historical Reliability and Maintainability Data
Draft	Life Cycle Cost Manual
Q-K051	Logistic Support Cost (LSC) Per Flying Hour
DO-56C	Bit and Piece Replacement Summary
DO-49	Component Item Review by Stock No.
F-15	Field Support PIP
OOALC	Post Production Support Program User Reference Manual
MIL-HDBK-217C	Military Standardization Handbook, "Reliability Prediction of Electronic Equipment"
AFSC/AFLC	Product Performance Agreement Guide
	Determination of the Cost to Retain Aircraft Weapon System - Report
DO-71	Stock Number User Directory
AFM 72-4	Master Requirements Directory (MRD)
GO-26	Weapon System/Equipment LOG
D-160B	LO/VAMOSC
H-8-1	Supply Code (Code-to-Name and Name-to-Code)
ALERTS	CY 76 through August 1983
	Failure experience Data Interchange Index
Presentation	Maintenance Cross Talk, Presentation on Electronic Component Screening (Project Pacer Alamo)
Presentation	Electronic Stress Screening of Electronic Hardware - Hughes
Presentation	Government Industry Data Exchange Program (AFLC)
Presentation	How to Improve Old and New Weapons Systems Using Environmental Stress Screening (Gould, Inc.)

A P P E N D I X   A

INSTRUCTIONS FOR

COST AVOIDANCE ESTIMATING SHEET

FIGURE 1

COST AVOIDANCE ESTIMATING SHEET

NOMENCLATURE:	ALERT NO.:
	GROUP TECHNOLOGY CODE:

ACTION TAKEN:

1. /_7 Ignore the alert
2. /_7 Attrite the item
3. /_7 Scrap the part
4. /_7 Rework the part
5. /_7 Request design change
6. /_7 Require thorough inspection
7. /_7 Revise performance limits
8. /_7 Require 100% test of the part
9. /_7 Direct supply service not to issue the part
10. /_7 Drop supplier (Q.P.L.)

COST AVOIDANCE:

For Actions 1, 9 or 10 above there is No Cost Avoidance = 0.0

FAILURE COST AVOIDANCE:

For Actions 3, 4, 5, 6 or 8

Estimated failure cost/occurrence	C_1 =	
Designed life	D =	
Actual life based on experience	A =	
Total No. of parts impacted	N_1 =	
Failure cost avoidance	$= C_1 x(1-A/D) x N_1$ =	____

MAINTENANCE COST AVOIDANCE:

For Actions 2 or 7

Estimated maintenance cost/occurrence	C_2 =	
M.T.B.F. of part on alert	M_1 =	
Expected M.T.B.F. of replacement part	M_2 =	
No. of parts impacted	N_2 =	
Maintenance cost avoidance	$= C_2 x(1-M_1/M_2) x N_2$ =	____

TOTAL COST AVOIDANCE: ____

____

Prepared By

FIGURE 2

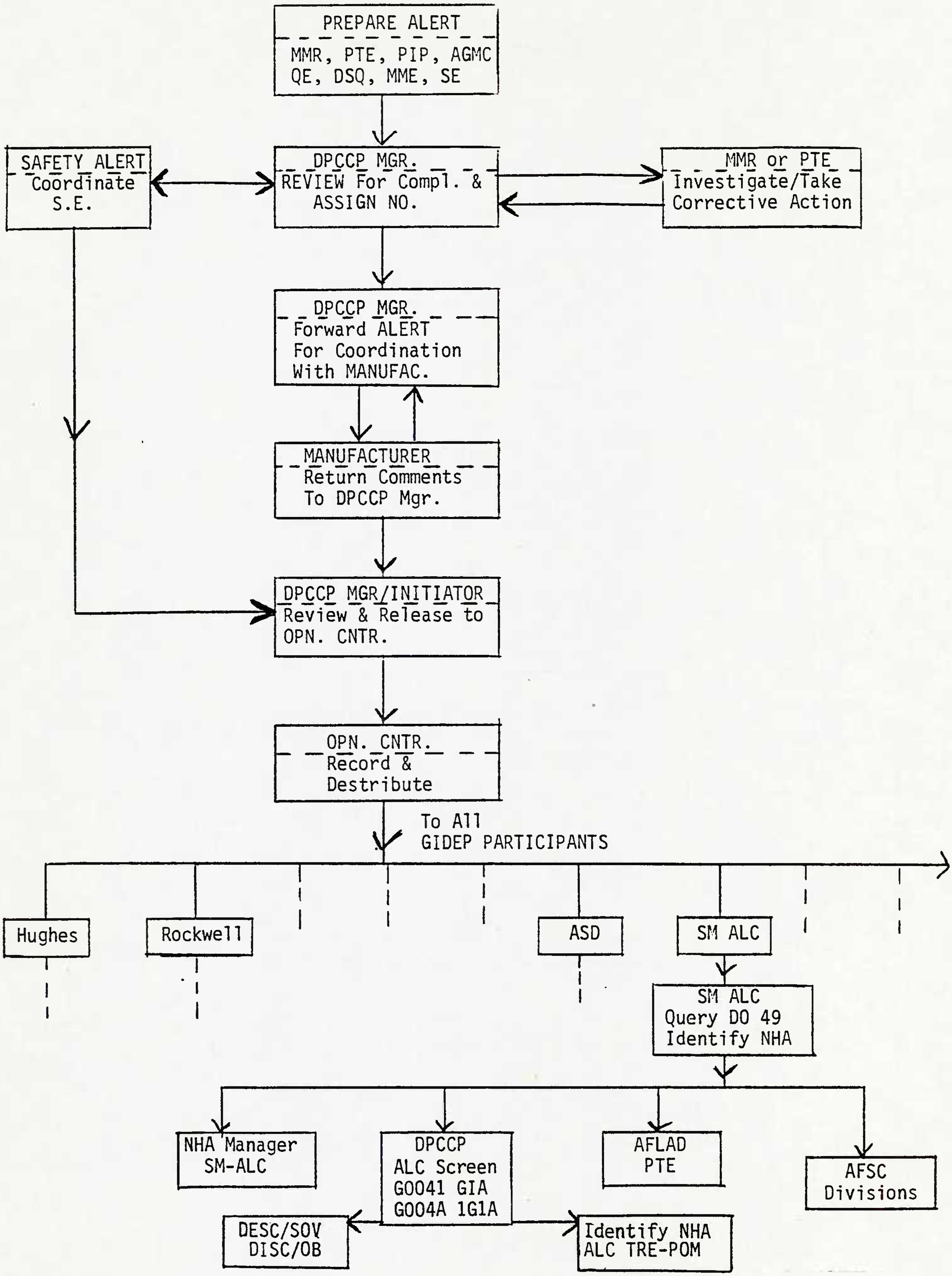
INSTRUCTIONS FOR COST AVOIDANCE ESTIMATING SHEET

Cost Avoidance Estimating Sheet, Figure 1, is to be filled out by each ALC and/or the contractor representative taking action because of an ALERT.

- Nomenclature: Fill in the item description.
- ALERT Number: Self explanatory.
- Group Technology Code: Transfer the group technology code identified on the ALERT. Please note that group technology code is assigned by the DPCCP manager of the organization issuing the ALERT.
- Action Taken: Check one or more of the actions taken against that ALERT. Please note actions 9 & 10 can be taken along with one of the other actions.
- Cost Avoidance: Failure cost avoidance or maintenance cost avoidance should be estimated by the ALC MM-R and/or contractor representative taking action on ALERT. Appendix B summarizes the reference documents that can be utilized to develop estimated costs. Appendix C provides quick "rule of thumb" estimates in case enough data is not available to develop detail estimates from Appendix B.
- Designed Life: It is the planned life of the item as reflected in the design.
- Actual Life: Life based on problems which are identified in the ALERT.
- $(1 - \frac{\text{Actual Life}}{\text{Designed Life}})$ provides the probability of failure prior to designed life.
- $(1 - \frac{\text{M.T.B.F. of Part on ALERT}}{\text{M.T.B.F. of Replacement Part}})$ provides the probability of unscheduled maintenance requirements.
- Actual Life, Designed Life: M.T.B.F. on part on ALERT and expected M.T.B.F. of replacement part to be estimated by ALC MM-R and/or contractor representative taking action on ALERT.

ALERT PROCESSING: MM-R INITIATED

Figure 3A



ALERT PROCESSING: CONTRACTOR INITIATED

Figure 3B

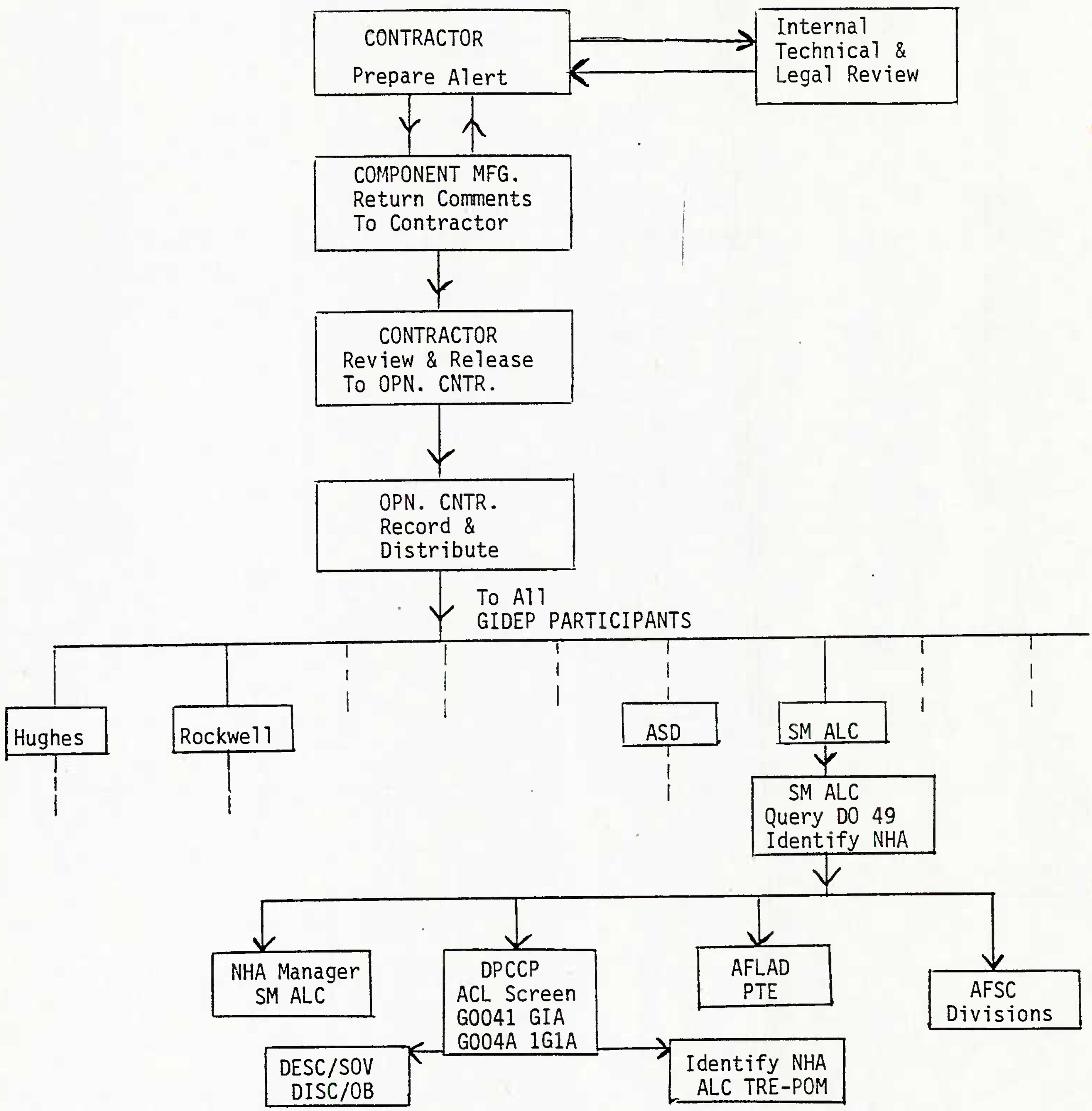


FIGURE 4

REFERENCE DOCUMENTS - COST ESTIMATING

Document No.	Cost Categories	Document Title
AFR 400-31	Operating and Support Costs -- Officer -- Airman } by mission assignment -- Civilian	Visibility and Management of Operating and Support Program Weapons Support Costs, VAMOSC/WSSC/CSCS
AFLCR 400-49	Component Support Cost System	Weapon System Effectiveness Program (VAMOSC) Component Support Cost System
	Weapon System Effectiveness Program -- Maintenance -- Contracting and Manufacturing -- Engineering -- Supply Material Management -- Quality Control -- Transportation	
DO-71	Where are Components Located	Stock Number Users Directory
AFLCP 173-10	Cost and Planning Factors -- Estimated Workloads -- Resource Requirements -- Costs (by aircraft, labor, material, other and G&A by Depot)	AFLC Cost and Planning Factors
AFLCP 173-3	Estimating Aircraft Logistic Support Costs -- New Systems Evaluated by Logistic Sources -- Estimate by Year and Number of Aircraft	A Guide for Estimating Aircraft Logistics Support Costs
AFR 173-13	Cost Planning Factors -- Estimate Resource Requirements -- Air Force Structure Mission Activities	USAF Cost and Planning Factors Regulation
AFLCM 173-265 HO-36C	Cost Retrieval System -- Establishes Reporting System for HO36C -- Report by WUC -- Component Cost Summary	Weapons System Cost Retrieval System
AFLCM 65-1 DO-49	Maintenance Data Collection & Retention -- Collection & Retention of Maintenance	Master Material Support Record

FIGURE 5

"RULE OF THUMB" ESTIMATES

- Cost of Avionics Repair: If it costs $1 to detect and replace a component at the component level, it will cost $10 at board level, $100 at the system test level and $1000 at the field level. (Source: Pacer Alamo).

- Cost of Failure on Electronic Components:

Level at Which Failure Occurs	Maintenance Cost per Failure
Module	$ 50
Subassembly	$ 150
System	$ 200
Field	$ 2000

- Technician man hours avoided at $40 per hour.

- Engineering man hours at $60 per hour.

Electronic components result in approximately 70 percent of the ALERTS and above "rule of thumb" estimates should be applicable to those with remaining items being discrete estimates.

A P P E N D I X   B

GIDEP ALERT HISTORICAL DATA

GIDEP ALERT

HISTORICAL DATA

TIME PERIOD: January

SOURCE: Failure Data Bank

ALERT	DATE	ITEM DESCRIPTION	CATE-* GORY	PROBLEM	CAUSE	CONTRACTOR RESPONSE	ACTION** TAKEN	SYSTEM IMPACTED	FAILUR RATE
RM-A-81-01	11/25/81	Variable register	0	Frequency sensitive circuits frequency drift, failure of operation, loose rotar shafts misallinged shafts, protruding "o" ring seals	Wiper lubricant contamination (epoxy cement particles)	Contractor agreed and is taking corrective action	8		9%
TX-A-81-26	01/04/82	Motors and motor generator	A	Motor is too large	N/A	Response was due for 19 Jan. No response.	6		
WR-A-81-26	01/04/82	Dial indicator	A	Items are out of tolerance, eratic or jammed. 32 of 108 were defective	N/A	Contractor reported sending 72 articles	6		33%
WR-A-81-20 B	01/07/82	Metal spring mounts	A	200 mounts stick at various positions and don't conform to load range	N/A	No reply from contractor	8		
EI-A-81-03	01/07/82	Resistors	0	Open circuits with cracked casings	28,500 resistors tested, 39 were found open. Zinc and chlorine were found on each of those 39.	Contractor reported this happening because of a unique set of circumstances. Contractor is taking corrective action.	9		1%
T3-A-81-02	12/14/81	Microelectronic circuit hex inverter	0	Bridging between adjacent terminals, several hundred units tested	Plating flashing at junction of leads and glass sealants	N/A	9		85-90%
7G-A-81-02	12/30/81	Transistor	D	Plating peeling off leads	Poor soldering and training voids were present	N/A	4		100%
TT-A-81-01	01/14/82	Microelectronic circuits	0	Microscopic cracks in the output transistor die	Poor attachment of the output transistor die to the ceramic subtrate wafer	No response	9		N/A
VV-A-82-01	01/19/82	Microelectronic circuits	0	July 1, 78 to to Aug 16, 81 - all parts possible defective because of only 40 hours burn in time	Not enough forging, each piece received less than 40 hours burn in time	This is from the contractor who made the part to all its customers	8		N/A
TX-S-82-01	01/14/82	Pressure valves, globe type	A	The charge line of the pressure valve seperates from valve at 1200 PSI injured operator	Valve manufactured in a two-piece design rather than as single unit. Also improper brazing is blamed	Contractor has made design changes	9		N/A

*Category:

A. Issued by A.F.
B. Issued by other DOD
C. Issued by NASA
D. Issued by Contractor

**Actions Taken:

1. Ignore the Alert
2. Attrite the item - use until exhausted
3. Scrap the part
4. Rework the part
5. Request ECP to modify design
6. Requires a thorough inspection of all stock and future acquisition
7. Revise performance limits
8. Require 100% inspection of
   - Installed
   - New
9. Direct the supplying servi not to issue the part
10. Drop supplier from Q.P.L.

GIDEP ALERT
HISTORICAL DATA

TIME PERIOD: January

SOURCE: Failure Data Bank

ALERT	DATE	ITEM DESCRIPTION	CATEGORY*	PROBLEM	CAUSE	CONTRACTOR RESPONSE	ACTION** TAKEN	SYSTEM IMPACTED	FAILURE RATE
TX-S-82-02	01/15/82	Electronic resistance bridges	A	Bridge failed "drop & spark" tests by the (UL)	Case cracked and batteries and base dislodged from holder. Improper manufacturing.	Autron MIG, Inc., has redesigned a replacement	9		N/A
WR-A-81-06B	01/15/82	Self-locking nut fasteners	A	Nut breaks due to hydrogene embrittlement	Improper or inadequate bake	Bristol Industries has taken corrective action	9		N/A
TX-S-82-03	01/20/82	Lithium batteries	B	Ability to rupture	N/A	N/A	3		N/A
OS-S-81-02	01/21/82	Rotary chair	A	Brake at weld point of the height adjustment	Improper manufacture of pedestal	N/A	6		N/A

*Category:

A. Issued by A.F.
B. Issued by other DOD
C. Issued by NASA
D. Issued by Contractor

**Actions Taken:

1. Ignore the Alert
2. Attrite the item - use until exhausted
3. Scrap the part
4. Rework the part
5. Request ECP to modify design
6. Requires a thorough inspection of all stock and future acquisition
7. Revise performance limits
8. Require 100% inspection of
   - Installed
   - New
9. Direct the supplying service not to issue the part
10. Drop supplier from Q.P.L.

GIDEP ALERT
HISTORICAL DATA

TIME PERIOD: February

SOURCE: Failure Data Bank

ALERT	DATE	ITEM DESCRIPTION	CATE-* GORY	PROBLEM	CAUSE	CONTRACTOR RESPONSE	ACTION** TAKEN	SYSTEM IMPACTED	FAILU RATE
B8-A-81-01B	1/15/82	Self-locking nut	D	Nuts break under torque. hydrogen embrittlement	Improper bake procedure	Contractor has revised "bake" methods. No reply on refund	9		N/A
C6-A-81-10	1/26/82	Electrical onnectors contacts only	D	Loose hood on contacts. Easily broken off	The loose hoods had longitudinal cracks	Contractor promptly replaced defective part	8		35%
VV -A-82-01A	1/28/82	Digital and linear microelectronic circuits	D	Possible weak structure prone to break	Improper born time	Contractor is willing to test and replace all circuits	8		N/A
TX-S-82-04	1/22/82	Automatic parachute ripcord (mechanical activator)	A	Does not operate as advised.	Contractor used stainless steel housing instead of rubber	N/A	8		N/A
H7-A-81-01	12/31/81	Microelectronic circuit	D	Internal bond wires touch the edge of the die during the vibration testing. Long term use would cause fusing of wires	Insufficient spacing of wires during production	Contractor willing to test failure devices	3		N/A
S3-A-82-01	2/4/82	Ceramic fixed capacitator	D	Capacitator was found to be open	Absence of a capacitator element	Contractor is improving QA procedures	6		N/A
D4-A-82-01	2/5/82	Nickel-cadmium batteries	D	Battery failed to meet performance requirements	Cracks and breaks in triangular spring. Negative terminals were not welded to case	Contractor maintains that the triangle spring is a filler and has nothing to do with the performance of the battery	4		100%
VU-A-81-01B	2/11/82	Digital microelectronic circuits	D	Product not in compliance with burn-in procedures	Did not receive full 160 hours of burn time	Contractor issued alert to its customers	8		N/A
GFSC-A-82-01	2/9/82	Digital microelectronic circuits	C	Circuits catch-up. Melt open V_{55} interconnection			8		
Q9-A-81-02	1/27/82	Solderless electrical connectors	D	Difficulty in plugging in and pulling out connectors	Improper plating process	Contractor willing to rework product	4		N/A
C6-A-81-10A	1/12/82	Contacts of electrical connectors	D	Loose hood which protects contact spring and aligns mating pin contact	Improper manufacturing resulting in longitudinal cracks	Contractor promptly replaced all hoods	8		35.

*Category:

A. Issued by A.F.
B. Issued by other DOD
C. Issued by NASA
D. Issued by Contractor

**Actions Taken:

1. Ignore the Alert
2. Attrite the item - use until exhausted
3. Scrap the part
4. Rework the part
5. Request ECP to modify design
6. Requires a thorough inspection of all stock and future acquisition
7. Revise performance limits
8. Require 100% inspection of
   - Installed
   - New
9. Direct the supplying serv: not to issue the part
10. Drop supplier from Q.P.L.

GIDEP ALERT
HISTORICAL DATA

TIME PERIOD: February

SOURCE: Failure Data Bank

ALERT	DATE	ITEM DESCRIPTION	CATE-* GORY	PROBLEM	CAUSE	CONTRACTOR RESPONSE	ACTION** TAKEN	SYSTEM IMPACTED	FAIL RAT
TG-A-82-01	2/15/82	Ceramic digital micro-electronic circuits	0	Circuit card assembly failed during 9 hour vibration test. Fractured leads and cracking and bending in others	N/A	Contractor says cracks and bending is normal and won't interfere in use. They don't know about the ones that broke	9		N/A
TX-S-82-01A	2/17/82	Electronic resistance bridges	A	Failed explosion test. Batteries fell from casing and casing broke	Improper manufacturing. These can't be used in a gas vapor area	Agreed device was unsafe and has designed a safe one	8		N/A
UP-S-82-01	2/15/82	Rotary office chairs	A	Cracks in plastic shell where screw attach rotary assemble to chair	Poor engineering	Contractor was shocked said only 6 of 70,000 have cracked and that the buyer must have used unusual stress on them	6		42
FE-A-81-01	12/16/81	Two input quadruple microelectronic circuit	0	Mismarked parts		N/A	9		

*Category:

A. Issued by A.F.
B. Issued by other DOD
C. Issued by NASA
D. Issued by Contractor

**Actions Taken:

1. Ignore the Alert
2. Attrite the item - use until exhausted
3. Scrap the part
4. Rework the part
5. Request ECP to modify design
6. Requires a thorough inspection of all stock and future acquisition
7. Revise performance limits
8. Require 100% inspection of
   - Installed
   - New
9. Direct the supplying servi not to issue the part
10. Drop supplier from Q.P.L.

GIDEP ALERT
HISTORICAL DATA

TIME PERIOD: March

SOURCE: Failure Data Bank

ALERT	DATE	ITEM DESCRIPTION	CATE-* GORY	PROBLEM	CAUSE	CONTRACTOR RESPONSE	ACTION** TAKEN	SYSTEM IMPACTED	FAILURE RATE
SM-S-81-04A	2/22/82	Wire rope	A+D	Possibility of failure resulting from separation of strands due to overload stress and fatigue fracture	Lack of lubrication. Lack of corrosion inhibiting compound	DOD testors agreed fatigue and lack of lubricant caused problem	7		N/A
F1-A-81-05	2/22/82	10 amp latch relay	D	Contacts failed to make electrical contact. Failed box testing, failed module testing	Glass dust due to worn glass actuator	Contractor replaced parts	4		90%
7G-A-81-02A	12/20/81	Transistor	D	Tinning voids, plating peeled off leads	Poor soldering	Contractor sent 350 bad pieces which happened to get by random checks	4		100%
EV-A-82-01	2/22/82	Threaded coupling fittings	D	Longitudinal cracks in the nuts	Cracks present in raw material	Contractor willing to replace all defective parts	6		N/A
TX-A-81-128	3/1/82	Capstan on a motor generator	A	Motor shaft too large	Mix-up between drawings and part numbers	Contractor replaced defective parts	9		100%
TT-A-81-01A	2/16/82	Positive voltage regulator for microelectronic circuit	D	Microscopic cracks in the output transistor die	Poor attachment of output transistor due to ceramic wafer	Contractor maintains part was sent in good condition and that the user broke it. They won't return new parts	6		100%
GO-A-81-06	10/15/81	Fixed inductance coils	D	Broken winding wire	Premature soldering time. Unsoldered parts	Contractor gave purchase price credit to buyer	8		N/A
EU-S-82-01	5/2/82	Fluoro polymer insulation wires and cables	A	Cracked insulation	Waiting for manufacturer response	N/A	9		N/A
G2-A-82-01	3/1/82	Printed circuit electrical connector	D	A tailwire broke during soldering	Deep tool marks and cracks on majority of contacts. Happened during stamping operation	Contractor willing to redo work	4		N/A
07-A-82-01	3/2/82	Detonator ignition parts	D	Detonators failed 500v pin to case insulation resistance test	Metallic particles in the internal spark gap	Contractor suggests further testing and delay the alert	6		N/A
TX-S-82-05	3/2/82	Scoop type front end loader	A	Faulty parking break and loose gear shift lever	N/A	Contractor blamed operator. Will not fix vehicle	4		N/A

*Category:

A. Issued by A.F.
B. Issued by other DOD
C. Issued by NASA
D. Issued by Contractor

**Actions Taken:

1. Ignore the Alert
2. Attrite the item - use until exhausted
3. Scrap the part
4. Rework the part
5. Request ECP to modify design
6. Requires a thorough inspection of all stock and future acquisition
7. Revise performance limits
8. Require 100% inspection of
   - Installed
   - New
9. Direct the supplying serv[illegible] not to issue the part
10. Drop supplier from Q.P.L.

GIDEP ALERT
HISTORICAL DATA

TIME PERIOD: March

SOURCE: Failure Data Bank

ALERT	DATE	ITEM DESCRIPTION	CATE-* GORY	PROBLEM	CAUSE	CONTRACTOR RESPONSE	ACTION** TAKEN	SYSTEM IMPACTED	FAILURE RATE
M6-S-82-01	3/12/82	Flourescent light source	C	Possible shock hazard	Broken ceramic wire connectors	N/A	4		75%
M6-S-82-02	3/8/82	Steel bolt fastener	C	Cracks across heads of hexigon bolts. Also, internal cracks were found	Seams in the steel which occur during the manufacturing process	Vendor admitted to over sight (they didn't catch the error until the batch was sent out) Agreed to return good bolts to user	9		
F1-A-81-06	3/10/82	Power transistor	O	Part failure	Metallic particles long enough to bridge the bond wires	N/A	8		42%
TX-A-82-01	3/8/82	Voltmeter	A	Erratic reponses	Improper maintenance of user	Vendor blamed problem on users, who misadjusted the instrument in an attempt to recalibrate it	8		N/A
G3-A-82-01	1/11/82	Glass dielectric fixed capacitator	O	Incorrect capacitance value	Mismarked parts by manufacturer	Distributor replaced parts	9		50%
TX-S-82-06	3/12/82	Automotive fuel filters	A	Plastic fuel filter failed resulting in fuel fumes and inoperable car	Plastic fuel filter instead of metal ones, which bulged and perforated.	N/A	9		N/A
F9-A-82-02	3/24/82	Microelectronic circuits	A	Fall-out during burn-in and preburn-in operations	Electro-static discharge	N/A	8		N/A

*Category:

A. Issued by A.F.
B. Issued by other DOD
C. Issued by NASA
D. Issued by Contractor

**Actions Taken:

1. Ignore the Alert
2. Attrite the item - use until exhausted
3. Scrap the part
4. Rework the part
5. Request ECP to modify design
6. Requires a thorough inspection of all stock and future acquisition
7. Revise performance limits
8. Require 100% inspection of
   - Installed
   - New
9. Direct the supplying service not to issue the part
10. Drop supplier from Q.P.L.

GIDEP ALERT

HISTORICAL DATA

TIME PERIOD: April

SOURCE: Failure Data Bank

ALERT	DATE	ITEM DESCRIPTION	CATEGORY*	PROBLEM	CAUSE	CONTRACTOR RESPONSE	ACTION TAKEN**	SYSTEM IMPACTED	FAILU RATE
X7-S-82-01	3/19/82	Non-rechargable lithium batteries	B	Batteries blew up when a heat gun was applied to activate the thermoset properties of the cells. 350° of heat	Batteries must be properly protected when heating above 200°F	N/A	5		N/A
R6-A-82-01	3/24/82	Variable high resolution vernier resistors. Potentiometer	D	Broken rotar, causing device to fail	Rotors slipped because of nylon lubricant characteristics	Manufacturer corrected problem by changing rotor material to lexan	4		N/A
RV-A-82-01	3/26/82	Microelectronic circuits (Fairchild)	D	Frequency sensitive, amplitude fell as frequency increased	Manufacturer marked item with wrong code	Manufacturer replaced all parts	3		N/A
J4-S-82-01	3/23/82	Swivel base locking bolt, vise	C	The bolts which secure the vise to a stationary position broke	Insufficient tensile strength. Bolts were made of iron instead of alloy steel	Manufacturer replaced old bolts with bolts to withstand 120,000 PSI	9		N/A
TX-S-82-028	4/1/82	Electronic resistance bridge	A	Part failed drop and spark tests conducted by Boeing, Inc.	Batteries fell out when case cracked. Not safe to use in hazardous vapor environment	Contractor has since designed a new safe device			N/A
EU-A-81-06	3/30/82	Variable resistor	A	Actuator arm of pressure sensitive switch breaks off during clockwise movement of variable resistor shaft	The pin operated by the variable resistor shaft forces the actuator arm up an incline. The pin forces the arm to move with the pin breaking the hinges	Litton is testing the devices	9		40%
WH-A-82-01	3/23/82	Wire and cable, copper, high temperature insulation	D	Wire breaks down under high voltage application	The wire concentricity is not within military specifications	N/A	9		100%
TX-A-82-03	4/1/82	Retaining ring	A	When spreader is used, the rings stay open, causing blade failure and engine damage	Rings are too soft. Lack of heat treatment	Vendor will replace all parts	9		100%
WR-A-82-04	4/1/82	Wire rope	A	Cable end extends 7" beyond swaged ferrule. Cable is used for a life raft and could puncture it	Rope was not made in accordance to drawing	Vendor agreed to fix all parts	4		100%
TX-A-81-14 & A	4/1/82	Integrated circuits	A	Packaging deficiency	Vendor sent box with no identification for what was inside. MIL-STD-129 calls for labels	Vendor denied need for special packaging	6		100%

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GIDEP ALERT
HISTORICAL DATA

TIME PERIOD: April

SOURCE: Failure Data Bank

ALERT	DATE	ITEM DESCRIPTION	CATE-* GORY	PROBLEM	CAUSE	CONTRACTOR RESPONSE	ACTION** TAKEN	SYSTEM IMPACTED	FAILURE RATE
88-A-82-01	3/31/82	Self-locking nut	O	Screws were very difficult to unscrew. They broke and had stripped threads	Incorrect gage size	Not clear	9		
F4-A-82-01	3/25/82	Microelectronic circuits	O	Unstable outputs during testing		Contractor is going to redesign the device	9		N/A
F3-A-82-01	3/29/82	Clamp, CRES	O	Clamp broke at the "T" bolt	Stress corrosion cracking	Clamp was replaced with a stronger one	9		N/A
KY-A-82-01	3/26/82	Rectifier switch diode	O	Reverse-recovery time was too fast		Contractor felt an alert should not have been issued on test grounds	8		
R6-S-82-02	3/21/82	Transient suppressor diodes	D	Two suppressor diodes exploded	Metal-cased zener diodes had ruptured due to high internal generated temp	N/A	9		
WR-A-82-02	3/31/82	Screwdriver	A	Brittle fractures across the blade	A metal alloy was used with a high content of non-metallic content	N/A	9		N/A
WR-A-82-03	4/5/82	Silicon control rectifier diode	A	SCR caused transmitter to draw excessive magnetron current	Failure of circuity	N/A	8		N/A
WR-S-82-02	4/16/82	Halogenated hydrocarbon aluminum	A	Underpressure it explodes	Violent reaction when HHL and aluminum are together in heat or pressure	Put out warning letters and contacted government agencies	5		

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GIDEP ALERT
HISTORICAL DATA

TIME PERIOD: May 1982

SOURCE: Failure Data Bank

ALERT	DATE	ITEM DESCRIPTION	CATE-* GORY	PROBLEM	CAUSE	CONTRACTOR RESPONSE	ACTION** TAKEN	SYSTEM IMPACTED	FAILURE RATE
C6-A-82-01	4/22/82	Microelectronic Ciccuit	D	Parts shorted out	Metal and silicon particles were found	Contractor will replace damaged items	4		70
1G-A-82-02A	5/7/82	Miniature Connectors	0	Male pin fell out of module housing	No retaining device for the pin	Directed buyer to manufacturer	8		N/A
06-A-82-01	4/26/82	Rivet	A	Rivets crack during installation	Lack of hardness	N/A	8		N/A
C6-A-82-02	5/5/82	Microelectronic circuits	0	10 of 120 failed electrical testing	Contained the wrong chip	Trying to locate remainder of the lot	8		8%
H1-S-82-01	5/4/82	Socket cap screws	0	Head of screw broke off	Screws do not meet ANSI standards for strength		5		75
WR-S-82-01	5/6/82	Forklift brake cylinder	A	Cracked brake wheel cylinders, causing lose of brake fluid, casuing lose of brakes	Excessive pressure from master brake cylinder	Dealer will replace parts	8		N/A
07-A-82-02	5/7/82	High pressure tanks inert gasses, tank parts	0	Small cracks inside ten titanium high pressure spheres, cracks confined to the heat affected fusion lines of the girth weld	Highly acidic, chloride containing fluid, in the electro-etching process	N/A	5		N/A
TX-A-82-04	5/11/82	Fourosilicon o-ring	A	O-rings were red instead of blue	O-rings made of the wrong material	Contractor replaced all parts	9		100%
QU-A-82-01	4/23/82	Fitting, nut, hydraulic fluid	0	Nut broke, resulting in hydraulic leakage	Nut was tempored incorrectly by manufacturer	N/A	10		100%
G2-A-82-04	5/12/82	Connector, feed thru bulk head, hermetically sealed, receptical pins	0	Corrosion, insufficient plating, low voltage, poor connectors	Contractor agreed to rework parts	N/A	4		N/A
RV-A-82-02	5/13/82	Microelectronic circuits	0	Wrong part	Mismarked parts	Contractor exchanged parts	9		100%
E7-A-82-01	5/13/82	Integrated circuits microelectronic circuits	0	Aluminum extrusions which short to matalization	Aluminum electromigration	TI tested it and agreed on failure	8		N/A
SM-S-82-01	5/19/82	Construction workers helmet	A	Cracks in the seam of the hats	Poor molding process	N/A	3		N/A

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GIDEP ALERT
HISTORICAL DATA

SOURCE: Failure Data Bank

TIME PERIOD: May 1982

ALERT	DATE	ITEM DESCRIPTION	CATE-* GORY	PROBLEM	CAUSE	CONTRACTOR RESPONSE	ACTION** TAKEN	SYSTEM IMPACTED	FAILURE RATE
TX-S-82-07	5/21/82	Wing flap rod ends	A	Cracks in bearing housing and bearings	Hydrogen embrittlement	N/A	8		1 plane
EU-S-82-02	5/8/82	Ottoman bench	A	Human puncture wounds damaged cover vinyl	Screws protrude top by ½"	Manufacturer has re-engineered	4		N/A

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GIDEP ALERT

HISTORICAL DATA

TIME PERIOD: June

SOURCE: Failure Data Bank

ALERT	DATE	ITEM DESCRIPTION	CATE-* GORY	PROBLEM	CAUSE	CONTRACTOR RESPONSE	ACTION** TAKEN	SYSTEM IMPACTED	FAILU RATE
E9-A-82-01	5/19/82	Single throw electrical switch	D	Thermostat failed to close at proper temperature	Particles were preventing current conduction through the closed contacts at initial contact temperature closure point	Manufacturer agrees to modify production to be cleaner	4		N/A
TX-S-82-08	5/27/82	Truck mounted de-icer spray	A	De-icing fluit ignited	Coils were plugged due to improper flushing	Changed flushing compound and added warnings	4		N/A
LC-5-82-01	5/20/82	Polyurethane jacket	A	Headaches from people working around wire jacket	At 120° jacket starts to melt but no fumes exist, does emit hydrogen cyonide gases	N/A	8		N/A
G5FC-A-81-01	12/1/81	Digital multimeter	D	Erratic resistance readings	Reversed connectors	Contractor disagreed with user findings	8		N/A
DG-A-81-01A	5/28/82	Illuminated push button electrical switches	D	Defective switches stuck in "on" position	Debris and miscellaneous manufacturing errors	Vendor replaced defective parts	9		6 of 23
GO-A-82-01	6/1/82	Chemical materials	D	Potassium contained nine times more "K" than usual	Mismarked package, it was actually potassium ionization buffer	Vendor is replacing materials	9		100%
TX-A-82-07	6/8/82	Aluminum surface cleaning compound		Should not be used on high strength steel; could cause hydrogen embrittlement		N/A	9		N/A
WR-A-82-06	6/7/82	Packing shield gasket	A	243 packing shields had a break in the circular copper shield. Couldn't hold pressure and leaked	N/A	N/A	9		100%
MD-5-82-01	6/2/82	Parachute cord	B	Didn't pass strength test	25 years old	N/A	10		100%
X026-5-82-01	6/1/82	3-door cabinet file	B	Cabinet tipped over	That's the way it's built, should have been anchored	N/A	4		N/A
K9-A-82-01	5/28/82	Electrical connector, plug	D	Distortion causing lack of contact force and intermittant contact	Inadequate plating for corrosion resistance. Poor heat treatment	Vendor will replace parts	9		N/A
EU-A-82-01	4/15/82	Packaging materials, integrated circuits	A	Damaged circuits	Electro-static discharge during shipping	N/A	9		N/A

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A P P E N D I X C

COST AVOIDANCE ESTIMATES

DEMONSTRATED PERIOD

COST AVOIDANCE ESTIMATES

TIME PERIOD: January

ALERT	GROUP TECHNOLOGY CODE	ESTIMATED COST AVOIDANCE	REMARKS
RM-A-81-01	EA1	1500	*1
TX-A-81-12A	EB1	5000	*1
*WR-A-81-26	EB1	1782	*1
WR-A-81-20B	MA1	10000	Based on 200 parts assumed.
E1-A-81-03	EC1	0	No cost avoidance.
T3-A-81-02	EB1	0	No cost avoidance.
TG-A-81-02	EN1	5000	*1
TT-A-81-01	EB1	0	None
VV-A-82-01	EB1	5000	*2
TX-S-82-01	MA1	0	Also assumed WBS application.
TX-S-82-02	EA1	0	None
WR-A-81-06B	MA1	200000	*1
TX-S-82-03	EA1	200000	*2
06-S-81-02	MH1	60000	*2 " "

*1 Assumed the number of parts to be 100 because the information was not available.

*2 Assumed the number of parts to be 100 and the failure rate to be 100% because the information was not available.

COST AVOIDANCE ESTIMATES

TIME PERIOD: February

ALERT	GROUP TECHNOLOGY CODE	ESTIMATED COST AVOIDANCE	REMARKS
B8-A-81-01B	EA1	0	None
C6-A-81-10	EF1	3500	*1
VV-A-81-01A	EB1	5000	*1
TX-S-81-04	MA1	1950	None
H7-A-81-01	EB1	5000	*1
S3-A-82-01	EC1	600	*1
D4-A-82-01	EC1	2850	None
GSFC-A-82-01	EA1	200	None
Q9-A-81-01	E	6000	None
C6-A-81-10A	EF1	3500	None
TG-A-82-01	ES1	0	None
TX-S-82-02A	EA1	0	None
VP-S-82-01	MH1	82600	None
FE-A-81-01	EB1	0	None

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COST AVOIDANCE ESTIMATES

TIME PERIOD: March

ALERT	GROUP TECHNOLOGY CODE	ESTIMATED COST AVOIDANCE	REMARKS
SM-S-82-01A	MA1	150000	*4
F1-A-81-05	EF1	4500	*1
7G-A-81-02A	EF1	950	None
EV-A-82-01	MA1	99000	None
TX-A-81-2B	MB1	0	None
TT-A-81-01A	EB1	200	None
GD-A-81-06A	MA1	3750	*2
EU-S-82-01	MB1	0	None
G2-A-82-01	EB1	50	*2
D7-A-82-01	EF1	880	None
TX-S-82-05	MG1	20000	*2
M6-S-82-01	MH1	75000	*1
M6-S-82-02	MF1	0	None
F1-A-81-06	EB1	1323	None
TX-A-82-01	EB1	162000	*1
G3-A-82-01	EB1	0	None

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*4 Assumed expected M.T.B.F. to be 100 hrs & estimated M.T.B.F. to be 50 hours for part on ALERT.

COST AVOIDANCE ESTIMATES

TIME PERIOD: March

ALERT	GROUP TECHNOLOGY CODE	ESTIMATED COST AVOIDANCE	REMARKS
TX-S-82-06	MG1	0	None

COST AVOIDANCE ESTIMATES

TIME PERIOD: April

ALERT	GROUP TECHNOLOGY CODE	ESTIMATED COST AVOIDANCE	REMARKS
X7-S-82-01	ED1	4000	*2
R6-A-82-01	EB1	200000	*2
RV-A-82-01	EB1	950	None
J4-S-82-01	MF1	0	None
TX-S-82-02B	EA1	0	None
EU-A-81-06	EB1	0	None
WH-A-82-01	MB1	0	None
TX-A-82-03	EA1	0	None
WR-A-82-03	ME1	5000	*2
TX-A-82-04	EA1	5000	*1
B8-A-82-01	MC1	0	None
F4-A-82-01	EB1	0	None
F3-A-82-01	MC1	0	None
KY-A-82-01	EB1	1224	None
R6-S-82-02	EB1	0	None
WR-A-82-02	MA1	0	None

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COST AVOIDANCE ESTIMATES

TIME PERIOD: April

ALERT	GROUP TECHNOLOGY CODE	ESTIMATED COST AVOIDANCE	REMARKS
WR-A-82-03	EB1	15000	*2
WR-S-82-02	CA1	8000	*2

*2 Assumed the number of parts to be 100 and the failure rate to be 100% because the information was not available.

COST AVOIDANCE ESTIMATES

TIME PERIOD: May

ALERT	GROUP TECHNOLOGY CODE	ESTIMATED COST AVOIDANCE	REMARKS
L6-A-82-01	EF1	3500	1 Assumed number of parts x 1
1G-A-82-02A	EC1	3496	none
DG-A-82-01	MA1	5000	2 Assured number of parts and number of failures x 2
CG-A-82-02	EF1	480	none
HI-S-82-01	MC1	11250	*1
WR-S-82-01	MG1	26000	*1
D7-A-82-02	CF1	5000	*2
TX-A-82-04	MG1	0	none
QU-A-82-01	MA1	0	none
G2-A-82-04	EA1	3750	*2
RV-A-82-02	EB1	0	none
E7-A-82-01	EF1	4700	*2
SM-S-82-01	AH1	1450	*2
TX-S-82-07	MA1	440160	none
EU-S-82-02	AH1	190000	*2

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COST AVOIDANCE ESTIMATES

TIME PERIOD: June

ALERT	GROUP TECHNOLOGY CODE	ESTIMATED COST AVOIDANCE	REMARKS
E9-A-82-01	EC1	5000	*3
TX-S-82-08	EG1	100000	*4
LC-S-82-01	MH1	200000	*2
GFSC-A-81-01	EF1	5000	*2
DG-A-81-01A	EA1	0	None
GO-A-82-01	CH1	0	None
TX-A-82-07	CA1	0	None
WR-A-82-06	MA1	0	None
MD-S-82-01	MA1	0	None
X026-S-82-01	MH1	15000	*2
K9-A-82-01	EB1	0	None
EU-A-82-01	EH1	0	None

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